

SAMPLE

SPACE ENVIRONMENT TESTBED (SET) EXPERIMENT

EEE PARTS PLAN

APRIL 2, 2004

REV. A

[THIS IS A SAMPLE PARTS PLAN FOR SET EXPERIMENTERS TO USE AS A GUIDE FOR THEIR OWN INDIVIDUAL PLANS. THIS PLAN WAS DEVELOPED BY GSFC'S SET PARTS ENGINEER. IT CONTAINS ITEMS WHICH WOULD BE HELPFUL IN GSFC'S EVALUATION OF EACH SET EXPERIMENT'S PARTS SELECTION. SOME SECTIONS MAY NOT APPLY TO CERTAIN EXPERIMENTS. IN SUCH CASES, THE EXPERIMENT'S PI SHOULD INDICATED THAT IT'S NOT APPLICABLE AND WHY. IF THERE ARE ANY QUESTIONS, PLEASE FORWARD THEM TO THE SET EXPERIMENT MANAGER AND SET PARTS ENGINEER.]

PREPARED BY:
SUSAN RITTER
SET PARTS ENGINEER

DATE: APRIL 2, 2004

*Experimenter's tile page should include:
Preparer's name and date*

Concurrence by: [PI should review and concur. If PI is also the preparer, duly note.]

SET EXPERIMENT PARTS PLAN

CHANGE RECORD PAGE

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SET EXPERIMENT PARTS PLAN

1 SCOPE

The purpose of this document is to present the EEE Parts Plan for SET Experiment _____, NRA-_____.

[In this section, insert a brief description of the experiment's scientific objective(s).]

1.1 RADIATION REQUIREMENTS

Insert a statement that contains specific total dose and SEE requirements. Your statement **MUST** contain the following information:

“EEE Parts should be capable of meeting _____krads (Si) Total Ionizing Dose (TID), Linear Energy Transfer Threshold (LETth) of > _____ MeV/mg/cm² for soft errors from single events (SEU, Single Event Transients, etc), and a LETth of > _____ MeV/mg/ cm² for potential destructive events (SEL, SEB, SEGR, etc.).”

Note: GSFC SET Project does not dictate the radiation design requirements for your experiments. You establish the criteria necessary to meet your specific scientific objectives. GSFC needs this information in order to fairly evaluate your Parts Selection and potential for success. We have suggested that you design for a “harsh” radiation environment in order to optimize your flight potential; such as we have done with the SET Carrier. FYI: As a guide, the following are SET Carrier’s radiation requirements:

EEE Parts should be capable of meeting 100krads (Si) Total Ionizing Dose (TID), Linear Energy Transfer Threshold (LETth) of >37 MeV/mg/cm² for soft errors from single events (SEU, Single Event Transients, etc), and a LETth of >80 MeV/mg/ cm² for potential destructive events (SEL, SEB, SEGR, etc.).” This latter category includes events deemed as non-destructive SELs that may have latent damage issues. Displacement damage should also be considered for parts susceptible to this type of effect. Parts that are not guaranteed to meet the above radiation requirements will be subject to review and approval by GSFC’s Parts Engineering and Radiation Effects Group. Lot specific radiation testing and/or use of mitigation circuits may be recommended.

2 PARTS CONTROL BOARD

The Parts Control Board (PCB) will be responsible for the management, selection, standardization and control of parts and associated documentation for the duration of the SET contract. The following people have been identified for this purpose: *[insert name of person who will assume responsibility for each function, the same person can be listed more than once]*

Electrical Designer: _____, phone number: _____
Experiment PI: _____, phone number: _____
Parts Engineer/Lead: _____, phone number: _____
Reliability Engineer: _____, phone number: _____
Quality Assurance Engineer: _____, phone number: _____
Configuration Control Mgr. _____, phone number: _____

The EEE Parts Plan will be submitted to GSFC for review and approval.

3 PARTS SELECTION

[Insert the basis for your parts selection.]

Hopefully, it will refer back to GSFC EEE-INST-002, Grade 3 guidelines and selection from GSFC PPL, MIL-STD-975 or NASA Parts Selection List (NPSL). Parts selected **MUST** meet radiation hardness

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requirements from section 1.1. To avoid additional screening costs, you may want to select from DSCC QML devices. I offer the following as a guide:

As a baseline, flight parts shall be selected and processed in accordance with GSFC EEE-INST-002, Grade 3. Only those EEE devices that meet the radiation requirements from section 1.1 will be selected. The following guidelines will be used as a minimum criterion for standard, use-as-is, parts:

Microcircuits, Monolithic:	MIL-PRF-38535, Class Q + PIND*
Microcircuits, Hybrids:	MIL-PRF-38534, Class H + Source Inspection + PIND*
Semiconductors:	MIL-PRF-19500, JANTX level + PIND*
Connectors:	Will use GSFC's 311 specifications for non-outgassing, non-magnetic connectors (brass shells with copper flash and gold plating).
Capacitors:	Selected from GSFC PPL, MIL-STD-975 or NPSL, Grade 3 or above
Relays:	Selected from GSFC PPL, MIL-STD-975 or NPSL, Grade 3 or above
Resistors:	Selected from GSFC PPL, MIL-STD-975 or NPSL, Grade 3 or above
Thermistors:	GSFC's spec S-311_P-18 is preferred
Wire/Cable	Selected from GSFC PPL, MIL-STD-975 or NPSL, Grade 3 or above
Crystal Oscillators	Type 1 per MIL-PRF-55310 or radiation harden equivalent to M55310
Optoelectronics	Selected from GSFC PPL, MIL-STD-975 or NPSL, Grade 3 or above
All other EEE Parts	Selected, manufactured, processed, screened and qualified, as a minimum, in the same manner as the nearest applicable quality level 3 device(s). GSFC PPL-21, Appendix C shall be used as a guideline for screening requirements.

Parts supplied by GSFC will be used "as-is", unless otherwise instructed by SET Project

*PIND is required for all cavity devices. Can be omitted if "getter" material is used by the manufacturer.

Note 1 from SET PPE: hermetic packaged devices are preferred. The use of plastic devices requires special handling and storage. Conformal coating is not hermetic and does not negate the handling and storage problems. Where hermetic, high reliability devices are not available, exceptions can be granted by GSFC.

Note 2 from SET PPE: Destructive Physical Analysis (DPA) is not required unless deemed necessary as indicated by failure history, GIDEP Alerts or other reliability concerns.

3.1 Parts Age Control

Parts with date codes less than five (5) years are preferred. Parts drawn from controlled storage after 5 years from the date of last full screening should be subjected to an electrical re-screen. Parts drawn from "uncontrolled" storage should be subjected to a mini-DPA (internal visual inspection to check for degradation to internal wiring and components). SET's PPE shall be notified of all devices that exceed the five year date code limit. These parts will have to be identified as a risk in the Project's Risk Management Report.

3.2 Parts Traceability

All EEE parts shall be traceable to manufacturer and lot/date code. [Note: experimenters should request manufacturer's Certificate of Compliance (C of C) with each purchase.] **[Experimenter – insert your name]** will maintain traceability from initial procurement and receipt through kitting, assembly traveler or production plan, test and final acceptance of the delivered product. Table 2 is a sample Kit Pull List which provides parts traceability (manufacturer and date code included) up to the experiment's assembly. To satisfy this traceability requirement, all other production documentation will reference the Assembly name, assembly number with revision level, and serial number as listed on the respective Kit Pull List(s).

3.3 Inorganic Materials

Materials used in the fabrication of flight hardware shall be compliant to the following selection criteria and used in a conventional application:

- Hazardous materials, including flammability, toxicity and compatibility as specified in Eastern and Western Range 127-1 Range Safety Requirements
- Vacuum Out gassing requirements as defined in NASA Reference Publication 1124, Rev. 4. Only materials that have a total mass loss (TML) <1.00% and a collected volatile condensable mass (CVCM) <0.10% shall be used unless a waiver is submitted and granted by GSFC.

[**Experimenter – insert name**] shall maintain of list of inorganic materials and composites which they plan to use during the manufacturing of their SET experiment. The Materials List must be submitted to GSFC for review and approval prior to flight build. ***[Experimenter can combine EEE Parts List and Material List into one Parts List.]*** Material processes shall be documented in the Data Acceptance Package, as required by the SET Experiment MAR.

3.4 Parts Derating

All EEE parts shall be used in accordance with the derating guidelines of GSFC PPL-21, Appendix B.

3.5 Alerts Reviews

If the Experimenter is a member of Government Industry Data Exchange Program, (GIDEP), he shall review Alerts for applicability to the parts proposed for use. Alert applicability, impact and corrective actions should be documented and submitted to GSFC for review. If Experimenter is not a member of GIDEP, a completed parts list, plus manufacturer's traceability, shall be submitted to GSFC at least two months in advance of Flight build. Note: to perform an Alert Review, GSFC will need the complete procured part number, generic part number, actual manufacturer of the device (do not list "QPL"), date code and how many are used per sub-system.

4 PARTS LIST

The Parts List will contain all parts planned for use in flight hardware, regardless of their approval status. The initial and subsequent updates to the Parts List will be submitted to GSFC for approval. Each update will denote a new revision level. Parts List shall be a composite of the parts selection for each design and should include, as a minimum, the following information: complete procured part number, generic part number, part name or functional description, approved manufacturer, need quantity, part use locations to the subassembly level, radiation tolerance. *[See Table 1 for sample of acceptable Parts List. Table 2 is a Kit Pull List sample; if similar document is used, it will suffice for an "as-built" parts list (part of the Experiment MAR requirement).]*